# RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603410F Space Systems Environmental Interactions Technology

PROJECT: 2822

| COST *($ In Thousands)* | FY 1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY 2004 Estimate | FY 2005 Estimate | Cost to Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| 2822 Space Environmental Impact Tests | 2,828 | 3,436 | 3,677 | 4,021 | 4,361 | 4,845 | 4,925 | 5,006 | Continuing | Continuing |
| Quantity of RDT&E Articles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**(U) A. Mission Description:** This Advanced Technology Development program's objectives are to improve the survivability and reliability of current and future DoD space systems, and develop and demonstrate cost-effective solutions to mitigate hazardous space-environmental interactions. These hazards include dangerous electrical discharges due to excess charge buildup on spacecraft components, degradation, and failure of structures and electronics due to long-term radiation doses, and single-event upsets (processor errors, memory corruption, etc.) due to high-energy penetrating radiation. As DoD dependence on space systems for mission critical operations and the use of unhardened commercial components increase, these effects will become more prevalent and serious. Advanced technology goals of this program are: (1) develop and demonstrate small, low-power, high performance space environmental monitoring systems; (2) provide improved specifications and analysis tools for design and application of advanced components and systems in DoD space systems; and (3) develop an autonomous on-board space-environmental hazard detection and control system to provide real-time warning and mitigation of space-environmental conditions likely to cause degraded satellite performance. These goals will be achieved through continued analysis and exploitation of data from current and past space experiments and through space flight of new experiments and prototype systems that investigate areas of concern to DoD spacecraft operations.

(U) FY 1998 ($ in Thousands):

- (U) $2,316 Launched prototype sensor and fabricated and tested upgraded sensors to improve Air Force Space Command environment specification and forecast systems for improved space system design and operations.
- (U) $181 Conducted joint National Aeronautics and Space Administration (NASA)-Air Force flight experiment to specify and predict the radiation environment and associated spacecraft charging hazards to enhance spacecraft survivability.
- (U) $331 Delivered three first-generation on-board radiation and charging hazard-warning detectors for test flights to enhance spacecraft survivability and situational awareness.
- (U) $2,828 Total

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(U) FY 1999 ($ in Thousands):

- (U) $2,014 Launch upgraded space plasma sensor and begin development of a third-generation sensor for a flight with the Communications/Navigation Outage Forecast System (C/NOFS) to support Air Force Space Command environment specification and forecast systems.
- (U) $662 Execute joint program with National Aeronautics and Space Administration (NASA) to improve high-voltage spacecraft charging hazard analysis tools for DoD and NASA spacecraft.
- (U) $679 Support joint United States/British Space Test Program to provide on-board hazard detection of space environmental conditions that degrade satellite performance. Begin design of small passive spacecraft charge control system to eliminate spacecraft charging hazards.
- (U) $81 Identified as a source for SBIR.
- (U) $3,436 Total

(U) FY 2000 ($ in Thousands):

- (U) $1,215 Complete design and fabrication of environmental sensors to support flight systems such as the C/NOFS and the National Polar-orbiting Operational Environmental Satellite System (NPOESS) to specify and forecast scintillation and other hazardous space environmental conditions that degrade satellite systems and communications.
- (U) $1,341 Support joint NASA-Air Force space initiatives to improve capability to specify and predict space environmental impacts on operational space systems.
- (U) $1,121 Develop systems to warn of spacecraft charging and other hazards for DoD and commercial spacecraft and investigate possibilities for alteration of space radiation environment.
- (U) $3,677 Total

(U) FY 2001 ($ in Thousands):

- (U) $1,441 Complete ground testing of space environmental sensor for flight with the C/NOFS. Support launch and on-orbit operations of Air Force and Joint Air Force-NASA instrumentation to provide improved space radiation hazard specification and forecasting.
- (U) $1,105 Support joint NASA-Air Force space initiative to advance spacecraft survivability, through collaborative experiments and design tool development.
- (U) $1,475 Develop systems to warn of spacecraft charging and other hazards to DoD and commercial spacecraft and begin design of systems to alter the space particle environment.
- (U) $4,021 Total

**(U) B. Budget Activity Justification:** This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new system developments that have military utility and address warfighter needs.

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(U) **C. Program Change Summary ($in Thousands):**

| | FY 1998 | FY 1999 | FY 2000 | FY 2001 | Total Cost |
|---|---|---|---|---|---|
| (U) Previous President's Budget/FY 1999 PB | 3,012 | 3,457 | 3,718 | 3,755 | Cont |
| (U) Appropriated Value | 3,151 | 3,457 | | | |
| (U) Adjustments to Appropriated Value | | | | | |
| a. Congressional General Reductions | -102 | -21 | | | |
| b. SBIR | -39 | | | | |
| c. Omnibus/Other Above Threshold Reprogrammings | -20 | | | | |
| d. Below Threshold Reprogrammings | -162 | | | | |
| (U) Adjustments to Budget Year Since FY 1999 PB | | | -41 | 266 | |
| (U) Current Budget Submit/FY 2000 PB | 2,828 | 3,436 | 3,677 | 4,021 | Cont |

(U) Significant Program Changes: Not Applicable.

FY 1999: $81 identified as a source for SBIR.

**(U) D. Other Program Funding Summary:**

(U) Related Activities:
- (U) PE 0602601F, Phillips Laboratory.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

**(U) E. Acquisition Strategy:** Not Applicable.

**(U) F. Schedule Profile:** Not Applicable.

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